

Seat No.: _____

Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-I Remedial examination March 2009****Subject code: 110005****Subject Name: Elements of Electrical Engineering.****Date: 19 / 03 /2009****Time: 02:00pm To 04:30pm****Instructions:****Total Marks: 70**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q1. (A)	Derive an expression for the capacitance of a parallel plate capacitor with plate area 'A' and distance of separation between the plates 'd' in M.K.S.	(07)
(B)	Two capacitors having $8 \mu\text{F}$ and $4 \mu\text{F}$ are connected in series and charged from a constant voltage of 210 Volts supply. Calculate (a) The voltage across each capacitor (b) The charge on each capacitor.	(07)
OR		
(B)	A capacitor of $10 \mu\text{F}$ is connected to a DC supply through a resistance of $1.1 \text{ M}\Omega$. Calculate the time taken for the capacitor to reach 90 % of its final charge.	(07)
Q2(A)	Prove that if a DC current of 'I' amperes is super-imposed in a conductor by an AC current of maximum value 'I' amperes, the root mean square (rms) value of the resultant is $(\sqrt{3}/\sqrt{2})I$.	(07)
(B)	Two branches numbered '1' and '2' having impedances of $3 + j4 \Omega$ and $3 - j4 \Omega$ respectively are connected to a 230 Volt, 50 Hz rms source. Find out : (i) The total current drawn from the source. (ii) Power factor of that current. (iii) Draw the phasor diagram for I_1 , I_2 , the total current and supply voltage.	(07)
Q3(A)	State and explain Kirchoff's voltage and current laws.	(05)
(B)	Draw Wheatstone's bridge network ABCD as follows: Resistance between terminals A-B, B-C, C-D, D-A and B-D are 10, 30, 15, 20 and 40 ohms respectively. A 2 volt battery of negligible resistance is connected between terminals A and C. Determine the value and direction of the current in the 40Ω resistor.	(05)
(C)	Show that $R_t = R_0(1 + \alpha t)$. Notations have usual meaning. The resistance of tungsten filament of a lamp is 20Ω at the room temperature of 20°C . What is the operating temperature of the	(04)

	filament if the resistance temperature co-efficient of tungsten is $0.005/\text{ }^{\circ}\text{C}$ at $20\text{ }^{\circ}\text{C}$. The base of the lamp is marked 120 Volt, 50 W.	
	OR	
Q3 (A)	Draw the circuit diagram of tubelight with the wiring of choke and starter. Explain the functioning of the circuit.	(05)
(B)	Explain the biological effect of electric current keeping the electric safety in view. Explain plate earthing.	(05)
(C)	Sketch the staircase wiring.	(04)
Q4 (A)	Give the comparison between electric and magnetic circuit.	(05)
(B)	Give the comparison of series resonance and parallel resonance.	(05)
(C)	State and explain Faraday's laws of electromagnetic induction.	(04)
	OR	
Q4 (A)	Two coils having 100 and 1000 turns respectively have a common magnetic circuit of 25 cm. diameter and 625 cm^2 cross-section and a constant relative permeability of 2000. Calculate (i) The self inductance of both the coils. (ii)The mutual inductance between them if the co-efficient of coupling is 0.5.	(07)
(B)	Write down the line value and phase value relationship of voltages and currents in 3 phase star and delta connected systems.	(07)
Q5 (A)	Draw and explain the wiring diagram of supply mains with energy meter and distribution box.	(07)
(B)	Give the circuit diagram of ELCB. Explain its working in brief.	(07)
	OR	
Q5 (A)	Explain the construction and working of any type of battery you know. What is its voltage when it is fully charged ?	(07)
(B)	The input power to a 3 phase load is measured by two wattmeter method. The ratio of the readings of the two wattmeters connected for 3 phase balanced load is 4:1. The load is inductive. Find the load power factor.	(07)
